

CH2M HILL Hanford Group, Inc.	Manual	ESHQ
FIRE HAZARD ANALYSIS AND FIRE	Document	TFC-ESHQ-FP-STD-06, REV A-3
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	Effective Date	January 9, 2006

[Ownership matrix](#)

1.0 PURPOSE AND SCOPE

(6.1.1, 6.1.2, 6.1.3)

This standard identifies the requirements, frequencies of application, and the inspection elements necessary for the development, conduct, reporting, and reactions to specific fire protection analyses and assessments.

This standard does not cover the monthly facility inspections required by NFPA 801, "Standard for Fire Protection for Facilities Handling Radioactive Materials." These are covered by TFC-ESHQ-S-STD-08, "Safety Inspections."

This standard applies to the following:

- Fire hazard analysis performed by or for CH2M HILL Hanford Group, Inc. (CH2M HILL).
- Fire protection facility assessments for CH2M HILL-managed facilities performed in accordance with DOE criteria.

2.0 IMPLEMENTATION

This standard is effective on the date shown in the header.

3.0 STANDARD

Fire protection assessments are documented evaluations of the implementation of the fire protection program. These include field walkdowns of facilities. Qualified fire protection engineers perform the assessments.

To the extent that required elements for a facility assessment are adequately covered by a facility fire hazard analysis or another assessment (within the same time period), a reference to the applicable fire hazard analysis section or assessment is considered adequate to satisfy that assessment element.

Assessments of the fire department (as required by this standard) shall be performed by an individual with qualifications and experience in all facets of fire department organization, equipment, staffing, and operations. Contractors shall perform program and facility assessments at a frequency described in this standard.

3.1 Fire Hazard Analysis

1. All new facilities and existing nuclear facilities shall have a fire hazard analysis prepared.
2. Construction projects must have a preliminary fire hazard analysis prepared at conceptual design and finalized at completion of construction.

NOTE 1: The level of detail in the fire hazard analysis should be commensurate with the complexity of the facility, its processes, and associated hazards. A graded approach may be used, where warranted.

NOTE 2: Fire computer models (such as CFAST¹) may be used as a tool to assist in developing fire scenarios and evaluating the potential consequences.

3.2 Fire Hazard and Facility Safety Analysis Documentation Integration

1. Facilities required to have a safety analysis report shall include or reference a fire hazard analysis as part of the report. The fire hazard analysis shall be documented (including all assumptions) by following the requirements outlined in this procedure, as well as HNF-SD-GN-FHA-30001.

When fire hazard analysis and safety analysis documents are required, fire hazards and associated scenarios (accident analyses, maximum possible fire losses, etc.) are jointly developed and consistently applied.

The criteria below provide for a common basis in the development of the fire hazard and safety analyses:

- Fire scenario(s) development must be completed early as part of the project/document development process. This is accomplished at the preliminary hazards assessment stage, done in association with engineering studies and at the conceptual design stage in projects to establish the bounding of accidents within related safety analysis documents.
- The fire hazard analysis author(s) must be familiar with the hazards analysis process and must participate in and/or review all the related hazard analysis process data. Ideally, the fire hazard analysis author(s) and safety document analyst(s) should jointly develop the preliminary hazards assessment (for fire related hazards) scenarios/consequences.
- The fire hazard analysis author(s) shall evaluate identified fire related hazards and possible fire event consequences (binning of related scenarios and using bounding events is acceptable). This evaluation will report fire propagation and effects on buildings, equipment, and processes.

NOTE: A single fire scenario may not be the representative or bounding event for both fire loss and safety analysis concerns. In this case, multiple scenarios will be analyzed.

- Reanalysis (revisions, updates, etc.) done by either the fire hazard analysis or safety documentation must be reviewed against the other document and changes made accordingly.

NOTE 1: Re-analysis is necessary to maintain agreement between documents.

¹ CFAST is a registered trademark of the National Institute of Standards and Technology.

NOTE 2: The above criterion is not meant to preclude the use of other processes when warranted by special conditions, provided agreement is maintained to accomplish the objectives of this procedure.

3.3 Competency Requirements

Any fire hazard analysis performed for CH2M HILL shall be under the direction of, or approved by, a qualified fire protection engineer. As a minimum, the analyses must contain information describing the following conditions:

- Description of construction
- Safety class systems
- Fire protection features
- Description of fire hazards
- Life safety considerations
- Critical process equipment
- High value property
- Damage potential: maximum possible fire loss and maximum credible fire loss
- Fire department/brigade response
- Recovery potential
- Potential for a toxic, biological, and/or radiological incident due to a fire
- Emergency planning
- Security and safeguards considerations related to fire protection
- Natural hazards (earthquake, flood, wind) impact on fire safety
- Exposure fire potentials, including the potential fire spread between fire areas
- Water runoff
- Fire barrier integrity (including their maintenance), fire safety training
- Inspection/testing/maintenance reports (for fire/life safety/water supply systems)
- Adequacy of the facility's self-appraisals
- Administrative controls (including compensatory measures), status of previous findings.

3.4 Applicability of a Fire Hazard Analysis

If a fire hazard analysis is done to replace a fire protection facility assessment, the following additional areas must be addressed in the fire hazard analysis.

1. Single Failure Criteria for Fire Hazard Analysis.

- Each fire hazard analysis shall assume that one installed automatic fire protection system will malfunction.
- If redundant automatic fire protection systems are provided in the area, only the system whose failure causes the most vulnerable condition is assumed to fail.
- Passive fire protection features (such as blank fire-rated walls or continuous fire-rated cable wraps) are assumed to remain viable.

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2. Selecting the Analysis Boundary.

The focus of the fire hazard analysis shall be the fire areas that comprise the facility. The boundaries of exterior fire areas (yard areas) shall be determined by the program secretarial officer or delegated authority. When a facility is not subdivided by fire-rated construction, the fire area shall be defined by the exterior walls and roof of the facility.

NOTE: A fire area is defined as a location bounded by fire rated construction having a minimum fire resistance rating of two hours, with openings protected by equivalently rated fire doors, dampers, or penetration seals.

3. Vulnerable Safety Systems, Structures, and Components.

- a. Fire hazard analysis inventory of all safety systems, structures, and components (SSCs) (i.e., safety class and safety significant SSCs within the fire area that are susceptible to fire damage).
- b. Includes primary and supporting mechanical and electrical systems that must function effectively during and after a fire event to assure safety (including safe shutdown, where applicable).
- c. Safety SSCs may include, but are not limited to:
 - Process monitoring instrumentation
 - Instrument air
 - Facility hydraulic system
 - Emergency lighting system.

NOTE: Loss of building ventilation system in a fire (due to damage to power cables) may result in an ambient air temperature rise which may cause the failure of sensitive electrical safety SSCs, such as relays.

4. Failure Modes for Safety Systems, Structures, and Components.

All credible fire-related failure modes of safety SSCs shall be considered.

NOTE: It will generally not be assumed in an analysis that fire will only cause the loss of function of the safety SSC equipment when power cables to that equipment are within the fire area. The potential for spurious signals causing mal-operation of such equipment or fire-induced electrical faults resulting in tripped upstream electrical disconnect devices rendering safety SSCs inoperable must be considered. Similarly, the effects of combustion products, manual fire fighting efforts, and the activation of automatic fire suppression systems, must also be assessed.

5. Ventilation System Operation and Failures Analysis.

Fire propagation and the potential for fire-induced radiological dispersal through the facility air distribution system must be considered. These effects must be considered for the normal operating mode of the air distribution system, as well as alternate modes that may result from the fire, such as shutdown.

6. Computer Models in Analysis.

An acceptable tool that may be used in the development of a fire hazard analysis is a computer fire model as applied by qualified fire protection engineers and approved by the RL authority having jurisdiction.

7. Simplifying Assumption.

Where appropriate, as a simplification to the analysis, an assumption can be made that all potentially vulnerable systems will be damaged within the fire area.

Acceptable exceptions to this assumption are:

- Water-filled steel pipes and tanks, and/or
- Similar components of superior structural integrity with welded fittings and adequate pressure relief

8. Combustible Material Present in Analysis.

The quantity and associated hazards of flammable and combustible materials that can be expected to be found within the fire area shall be factored into the analysis. Presence of transient combustibles associated with storage and maintenance activities. Averaging combustible loading over the floor or fire area as a means to characterize the fire severity is not considered an acceptable technique.

9. High Bay Facilities and Areas.

The fire hazard analysis for high bay locations shall consider the effects of smoke/hot gas stratification that may occur at some intermediate point below the roof or ceiling. Similarly, the effect of smoke movement through doors and dampers held open by fusible links will be addressed.

3.5 Revised Fire Hazard Analysis

1. The fire hazard analysis must be revised when a change or modification to the facility or operation affects the conclusions of the original analysis.
2. The FHA will be reviewed annually and revised, if necessary.

3.6 Fire Hazard Analysis Approvals

All fire hazard analyses require the TFC Safety and Health organization fire protection engineer's review and approval.

The fire hazard analysis (all new analyses and updates that affect the conclusions of the original analysis) must be submitted to DOE for review and approval.

3.7 Fire Hazard Analysis Records

The fire hazards analysis is considered record material and shall be retained in accordance with [TFC-BSM-IRM DC-C-02](#).

3.8 Fire Protection Facility Assessment Requirements

1. The CH2M HILL fire protection engineer shall prepare an annual fire protection facility assessment schedule for the facilities under their responsibility in accordance with the frequencies provided below.

NOTE: The reliability of such information is enhanced when there is frequent communication with Property Records. Incorrect information such as that relating to facilities improperly included in the list, missing from the list, must be identified and communicated to Property Records. This action will assist in maintaining a current database.

NOTE: When "MEMM" is noted on the Building Replacement Cost Property List, this means the facility has been zeroed out and removed from the general ledger. The value shown on the list was the value of the facility at the time it was removed from the ledger.

2. Annual assessments shall be made of facilities valued in excess of \$100 million (structure and content); where considered to be high hazard (non-nuclear) or Category 1 (nuclear).
3. Assessments shall be made at least every three years for remaining facilities.

EXCEPTION: An assessment is not required when all the following conditions apply to the facility: 1) the property value (building and contents) is less than \$250K; 2) the facility does not contain hazardous or radioactive materials; and 3) the facility does not have a significant programmatic importance (i.e., it has not been designated as vital by DOE).

- a. Facility assessments shall address, as a minimum, the following items as they relate to fire protection:

- Fire protection of safety class systems
- Life safety
- Vital programs
- Fire protection of high value property
- Inspection, testing, and maintenance reports
- Suppression equipment
- Water runoff
- Pre-fire plans
- Fire apparatus accessibility
- Administrative controls
- Temporary protection
- Completeness of fire hazards analysis
- Fire barrier integrity

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- Fire loss potentials* (maximum credible and maximum possible), status of findings from previous survey
- New findings resulting from the current survey.

*See DOE M 231.1, Appendix C, for determining loss estimation

- b. The assessments shall be performed using the “long” form or “short” form. The long form is intended for large, high-valued facilities, while the short form is intended for small low-valued facilities. The company fire protection engineer shall determine the appropriate form to use based on the individual facility being assessed.
- c. Findings or recommendations noted in assessments will be documented on a Problem Evaluation Request, in accordance with [TFC-ESHQ-Q C-C-01](#).
- d. The complete written reports shall be issued whenever updates are required or more frequently as determined by the company fire protection engineer.
- e. A facility fire hazards analysis may serve as a substitute for the fire protection facility assessment provided all aspects of the facility assessment are clearly addressed in the fire hazard analysis.

3.9 Fire Protection Program Assessments

1. Fire protection program assessments shall be made every three years.
2. Fire protection assessments shall be retained by the contractor and made available to the Office of River Protection representative upon request. Copies of the two most recent assessment reports shall be readily accessible on file (e.g., data file).
3. Fire protection assessment findings, observations, and/or recommendations shall be ~~tracked (e.g., using a computerized tracking system database) and shall be prioritized to ensure that effective actions are being taken to correct deficiencies identified in accordance with 10 CFR 830.120 for nuclear facilities and contract requirements and for non-nuclear facilities~~ documented on a Problem Evaluation Request (PER) in accordance with TFC-ESHQ-Q C-C-01. This shall include assessments generated both internally and externally.
4. Assessments shall include the following program elements:
 - Comprehensiveness of the fire protection program
 - Procedures for engineering design and review
 - Procedures and personnel for maintenance, testing, and inspection
 - Fire protection engineering staff (number, qualifications, training)
 - Fire suppression organization (personnel and training)
 - Fire suppression mutual aid agreements
 - Management support
 - Exemptions and documented equivalencies
 - Inspection, testing, and maintenance reports
 - Adequacy of facility appraisal/assessment reports

- Tests of fire suppression systems, water supplies, and procedures for maintaining them in working order
- Administrative controls
- Temporary protection and compensatory measures
- Status of findings from previous assessments
- Conformance with applicable orders, codes, and standards
- Findings, observations, or recommendations that are required to be corrected to meet the fire protection objectives.

4.0 FIRE SAFETY EXEMPTIONS AND EQUIVALENCIES

It is not the intent of this standard to prevent the application of alternative fire protection methods that will meet the objectives of DOE O 420.1, DOE O 440.1A, or ORP M 420.1-1. Therefore, fire safety exemptions and equivalencies from these requirements are permitted. The process begins with a determination that a basis for an exemption or equivalency exists. An analysis is then developed to evaluate its potential acceptability. The level of documentation necessary to support these requests will vary, depending on the issue. As a minimum, each request must address the following elements.

- The specific site location or condition for which the exemption or equivalency is requested.
- The specific requirement from which the request seeks an exemption or equivalency.
- Detailed statements of why the contractor is unable to comply with the requirement or why it is inappropriate in the given situation.
- A statement of the actions planned or taken to provide equivalent protection from the hazards covered by the requirement.
- An analysis of the benefit to be gained from the exemption or equivalency (or negative impact on the program or facility if the request is not approved) versus the maximum loss potential under the equivalency or exemption.
- Supporting documentation justifying approval of the exemption or equivalency, including a review by a qualified fire protection engineer. Exemptions and equivalency requests for fire safety issues involving facilities that require a fire hazard analysis must be supported by the facility FHA and can be included in the FHA approval process, if exclusive to the facilities and activities scoped in the FHA.
- Duration for which the request is being made.
- Information required by DOE M 251.1-1A, "DOE Directives System Manual."

The process for the review and approval of fire protection-related exemption and equivalency requests is as follows.

- The request is submitted to ORP.

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- Authority for approval. The authority for approval of fire protection-related exemptions and equivalencies is contained in DOE O 420.1, DOE O 440.1A, ORP M 420.1-1, and DOE Occupational Safety and Health Response Line Request Numbers D98-01-020 and D98-08-009.

5.0 DEFINITIONS

No terms or phrases unique to this standard are used.

6.0 SOURCES**6.1 Requirements**

1. DOE O 420.1A, "Facility Safety." (S/RID)
2. ORP M 420.1-1, "ORP Fire Protection Program." (S/RID)
3. RPP-MP-003, "Integrated Environment, Safety, and Health Management System Description for the Tank Farm Contractor."

6.2 References

1. DOE M 231.1, "Environment, Safety and Health Reporting Manual."
2. HNF-SD-GN-FHA-30001, "Integration of Fire Hazards Analysis and Safety Analysis Report Requirements."

~~3. TFC BSM-AD-C-01, "Administrative Document Development and Maintenance."~~

3. TFC-BSM-IRM_DC-C-02, "Records Management."

4. TFC-ESHQ-Q_C-C-01, "Problem Evaluation Request."